

## Claims

1. A method for producing silicon nitride films by thermal chemical vapor  
5 deposition, comprising the steps of feeding a trisilylamine gas and an ammonia gas into  
a chemical vapor deposition reaction chamber that holds at least one substrate, forming  
a silicon nitride film on said at least a substrate by reacting the two gases under  
predetermined temperature and pressure conditions, said method further comprising  
the step of providing a flow rate ratio of the ammonia gas to trisilylamine gas fed into  
10 said reaction chamber equal to or greater than 10.

2. The method according to claim 1 for producing silicon nitride films, wherein the  
predetermined temperature conditions of the reaction between the aforesaid  
trisilylamine and ammonia gas is set at a temperature which is equal to or lower than  
15 600°C.

3. A method for producing silicon nitride films by thermal chemical vapor  
deposition, comprising the steps of feeding a trisilylamine gas and an ammonia gas into  
a chemical vapor deposition reaction chamber that holds at least one substrate, forming  
20 a silicon nitride film on said at least one substrate by reacting the two gases afore  
mentionned under predetermined temperature and pressure conditions, said method  
further comprising the step of setting the predetermined temperature of the reaction  
between the aforesaid trisilylamine and ammonia gas is set at a value equal to or lower  
than 600°C.

25 4. A method for producing silicon oxynitride films by thermal chemical vapor  
deposition, said method comprising the steps of :

feeding a trisilylamine gas, an ammonia gas, and an oxygen-containing gas into a  
chemical vapor deposition reaction chamber that holds at least one substrate; and  
30 forming a silicon oxynitride film on said at least one substrate by reacting these  
gases, under predetermined temperature and pressure conditions.

5. The method according to claim 4 for forming silicon oxynitride films, wherein the aforesaid oxygen-containing gas is selected from the group essentially consisting of  $O_2$ ,  $O_3$ ,  $H_2O$ ,  $H_2O_2$ ,  $NO$ ,  $NO_2$ , and/or  $N_2O$  or any mixture thereof.

5        6. A method for producing silicon oxynitride films by thermal chemical vapor deposition, comprising the steps of :

          feeding a trisilylamine gas and at least one gas containing both oxygen and nitrogen as constituent elements into a chemical vapor deposition reaction chamber that holds at least one substrate; and

10        forming a silicon oxynitride film on said at least one substrate by reacting the two gases under predetermined temperature and pressure conditions.

          7. The method according to claim 6 for forming silicon oxynitride films, wherein the aforesaid gas containing both oxygen and nitrogen as constituent elements is selected  
15        from the group consisting of  $NO$ ,  $NO_2$ , and/or  $N_2O$  or any mixture thereof.

          8. The method in accordance with claim 1 or 2, wherein the flow rate is greater than 20.